OYSTER REEF ECOLOGY LAB

CONTENTS

RIVER CENTER

The River Center is a program of the Loxahatchee River District. The Loxahatchee River District, an award-winning wastewater treatment facility established in 1971 to protect the Loxahatchee River from pollutants, is the leading authority on the Loxahatchee River. Its physical plant can treat up to 11 million gallons of wastewater from northern Palm Beach and southern Martin Counties each day, preventing those pollutants from entering our watershed. This special district also provides both scientific and educational programs for the Loxahatchee River and serves as an advisory agency for the many diverse efforts under way.

LOXAHATCHEE RIVER ENVIRONMENTAL CONTROL DISTRICT • 1971 •

WWW.LOXAHATCHEERIVER.ORG

PREVISIT INFORMATION

We are delighted that you have chosen to bring your students to the Loxahatchee River District's River Center for an educational field experience. The River Center staff would like for your visit to be as fun and educational as possible. The goal of this field experience is to instill the students with an understanding and appreciation of the Loxahatchee River watershed through its unique plant and animal habitats as well as a new perspective on water resources and conservation. To make this an enjoyable field trip for teachers, students, and our program presenters, please follow these guidelines.

Please Read

Please contact the River Center if you will be *more than 15 minutes late* or for any questions, concerns, or changes at 561-743-7123 ext. 4200 or Education@LRECD.org.

SCHEDULE

PROGRAM: 10 A.M. - 12 P.M.
LUNCH: 12:15 P.M.

Classes that usually eat lunch between 10:30am and 11:30am should have a snack before or during the bus ride to the River Center. Groups may have lunch after 12:00pm at the River Center's chickee hut.

RECOMMENDATIONS FOR A GOOD TRIP

- Students should wear name tags with their first name.
- Chaperones: 1:6 ratio for younger groups (ages 5-9) or 1:10 ratio for older groups (ages 10+).

EXPECTATIONS

- Teachers and chaperones will be responsible for discipline of the children. ***All adults will be active participants in the activities with the children.***
- Students are expected to be good listeners, respectful to our program presenters, listen carefully and follow directions.
- There are live animals on site and in aquaria, so please do not tap or bang on the aquariums or exhibits in order to avoid stressing the animals.
- Students should practice classroom behaviors including keeping their hands to themselves, not talking out of turn, and watching for attention clues.
- To minimize distractions for students, ***please remind all chaperones and teachers to switch cell phones to silent.***

ADDRESS AND DIRECTIONS

Address: 805 U.S. Highway 1 Jupiter, FL 33477

Directions:

- I-95: Exit 87A (Jupiter Exit) East Indiantown Road (Turnpike: Exit 116 Indiantown Road)
- Indiantown Road: Travel EAST until you reach U.S. Highway 1
- Turn Left (NORTH) onto U.S. Highway 1
- Travel NORTH through one spotlight, turn right (EAST) at the flashing light into Burt Reynolds Park.
- The River Center is the light blue building located by the fire station.

CHECKLIST

MY NOTES

SURVEY LINKS

In-Person Field Trips:
https://www.surveymonkey.com/r/RCschool

Virtual Field Trips:
https://www.surveymonkey.com/r/rcvirtual

- ○ BUS RESERVED
- ○ PERMISSION SLIPS
- ○ PRE-LESSON PLANS TO TEACHERS
- ○ COMMUNICATE ANY 504/IEP/ESOL/ESE/ ACCESSIBILITY ISSUES

- ⚙ STUDENT NAME TAGS
- ⚙ 1:6 RATIO FOR CHAPERONES
- ⚙ PACKED LUNCHES
- ⚙ SNACK BEFORE PROGRAM
- ⚙ DIRECTIONS FOR THE BUS DRIVER

- ☐ COMPLETE RIVER CENTER SURVEY
- ☐ POST-LESSON PLANS TO TEACHERS
- ☐ POST LESSON EVALUATIONS

BACKGROUND

Oyster reefs provide important benefits to the overall health of the Loxahatchee River by cleaning water, stabilizing shorelines and providing essential fish habitat. Oyster reefs have declined in the river due to a lack of hard surfaces where oyster larvae can attach. The Loxahatchee River District and their partners are working together to restore and conduct research on the oyster reefs in the Loxahatchee River. This restoration and research show that oysters provide remarkable habitat that is home to a variety of fish, crabs, shrimp and other valuable species, while providing new areas for larval oysters to grow.

VOCABULARY

- Classification
- Kingdom / Phyllum / Class / Order / Genus / Species
- Habitat
- Ecosystem
- Estuary
- Food web
- Food chain
- Producers
- Consumers
- Decomposers
- Detritus
- Diversity
- Abundance
- Mollusks
- Restoration
- Juvenile
- Species
- Watershed
- Protection
- Mangroves
- Oyster
- Filter feeders
- Substrate
- Sessile
- Observation
- Phylum
- Predator
- Prey
- Bivalve

STANDARDS

THIRD GRADE SCIENCE

SC.3.N.1.1 Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

SC.3.N.1.2 Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups/

SC.3.N.1.3 Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.

SC.3.N.1.5 Recognize that scientists question, discuss, and check each other's evidence and explanations.

SC.3.N.1.6 Infer based on observation.

SC.3.L.15.1 Classify animals into major groups (mammals, birds, reptiles, amphibians, fish, arthropods, vertebrates and invertebrates, those having live births and those which lay eggs) according to their physical characteristics and behaviors.

FOURTH GRADE SCIENCE

SC.4.N.1.1 Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

SC.4.N.1.2 Compare the observations made by different groups using multiple tools and seek reasons to explain the differences across groups.

SC.4.N.1.4 Attempt reasonable answers to scientific questions and cite evidence in support.

SC.4.N.1.5 Compare the methods and results of investigations done by other classmates.

SC.4.N.1.6 Keep records that describe observations made, carefully distinguishing actual observations from ideas and inferences about the observations.

SC.4.L.17.4 Recognize ways plants and animals, including humans, can impact the environment.

FIFTH GRADE SCIENCE

SC.5.L.15.1 Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.

SC.5.L.17.1 Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics..

SC.5.N.1.1 Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.5.N.1.6 Recognize and explain the difference between personal opinion/interpretation and verified observation.

SC.5.N.2.2 Recognize and explain that when scientific investigations are carried out, the evidence produced by those investigations should be replicable by others.

MATH

3 - MAFS.3.MD.2.4
4 - MAFS.4.MD.1.1, MAFS.4.MD.2.4
5 - MAFS.5.MD.1.1, MAFS.5.MD.2.2

LANGUAGE ARTS

3 - LAFS.3.SL.1.1, LAFS.3.SL.1.3
4 - LAFS.4.RI.1.3, LAFS.4.RI.3.7 LAFS.4.SL.1.1, LAFS.4.SL.1.3, LAFS.4.SL.2.4, LAFS.5.RL.2.6 LAFS.3.RI.1.3
5 - LAFS.5.RI.2.6, LAFS.5.W.3.8 LAFS.5.SL.1.1

LESSON TARGETS

- I can define the concepts of habitat, energy transfers, and food webs.
- I can recognize the factors that influence or change oyster and estuary habitat.
- I can explain the difference between species abundance and diversity.
- I can identify animals found in oyster reef habitats.
- I can recognize the importance of water resources and water conservation.

DIFFERENTIATION STRATEGIES

- Working in a group setting to explain vocabulary
- Use of open-ended questions
- Relate topic to their everyday life
- Hands-on Instruction
- Tutor/Peer Buddy activities
- Use of Visuals
- Modification of Text or Curriculum

TEACHER MATERIALS

- Select a site in your schoolyard with several tree or shrub species
- Provide "There's No Place Like Home" worksheet located at the end of this document.
- Oyster farming, production, and habitat loss reference information
- Oyster reef restoration reference information

STUDENT MATERIALS

- Pencil
- Hand lenses
- Clipboard
- Activity worksheet
- Computer Access
- Research references

ENGAGE

PRE-VISIT LESSON - Complete before visiting the River Center

Discuss the concept of microhabitat reminding students that "micro" means small and "habitat" is where an animal finds it food, water, shelter, and space (an organism's neighborhood). Ask your students to identify and describe the different microhabitats they might find throughout the schoolyard like on a large oak tree, parking lot, or drainage ditch. Students will learn about microhabitats in their schoolyard which will be interpreted into microhabitats of the estuary with oyster reefs of the Loxahatchee River.

1. Divide students into groups of 2-3 and assign each group a plant to study and instruct students to work together to complete a group worksheet
2. Encourage students to examine the entire plant (including bark, living leaves, dead leaves, accessible roots, flowers, branches, and seeds or nuts).
3. Have them record different findings on their worksheets
4. After 10-15 minutes, call the class together and let each group point out the different microhabitats located on its plant to the rest of the class
5. Conduct a whole-class discussion addressing the following questions:
    a. How many different microhabitats could you find on one plant?
    b. What kind of organisms do you think might live in each of the microhabitats?
    c. Describe and identify any animals you found in those microhabitats.
6. Make sure students understand how important these microhabitats are for both the plants as well as the organisms living within them.
7. Students should realize that many organisms are adapted to live in very specific microhabitats or feed on specific parts of plants.

EXPLORE

VISIT TO THE RIVER CENTER

1. Welcome, introduction to the River Center, overview of today's field trip, and safety/rules talk
2. Divide the students into 2 groups to rotate through 3 different activities
    a. Lovin' the Loxahatchee River Tour – focusing on oyster and mangrove habitats and the estuary, inlet, and marine ecosystems
    b. Oyster Reef Ecology Lab: hands-on activity (See below)
    c. Water resources discussion
        iv. Where does our water comes from?
        v. How we use water in our everyday lives?
        vi. Where it goes once it flows down the drain?

vii. What is the process of wastewater treatment?

viii. How can I help? Water conservation

3. Touch tank demonstration

EXPLAIN

OYSTER REEF ECOLOGY LAB - Completed at the River Center

1. Students will be divided into groups of 2-3 and each given collecting dishes, pipettes, turkey baster, and collection containers. Each group will receive an oyster bag containing oyster shells that have been removed from the river prior to arrival.
2. While water is poured over the oyster bag, another student shakes the bag vigorously allowing the organisms to fall out into the bucket below. Other team members collect the organism to identify and examine under microscopes.
   a. Some examples are decaying mangrove leaves, mangrove propagules, seeds, sea grasses, snails, ampithoidae, crabs, shrimp, small fish, etc.
3. A class discussion on what each team found and relating it to the oyster reef habitat as a micro-habitat in the estuary ecosystem. Students are getting a firsthand look at the primary consumers of the food web as well as the understanding of the fish nursery food supply.
4. Class data is collected to see the diversity and abundance of plants and animals as well as quantity of each species. Students will collaborate on their data findings and create appropriate graphs.

ELABORATE

POST-VISIT LESSON - Complete the reflection after visiting the River Center

1. Have the students research major oyster farming and production found throughout the United States such as Washington, the Chesapeake Bay, and Apalachicola.
2. Discuss why these estuaries have been so productive, the history of habitat destruction and over production
3. Have the students research oyster reef restoration projects in Martin, St. Lucie, and Palm Beach County
4. Loxahatchee River District Oyster – restoration and monitoring: https://loxahatcheeriver.org/river/oyster/
5. Oyster Reef Restoration programs - http://www.oysterrestoration.com/

EVALUATE

POST-VISIT

1. Participation in the activity.
2. Write about your experiences at the Loxahatchee River Center.
3. Grade assessment and participation of the pre and post activities described in the Engage and Elaborate sections.
4. Grade assessment on vocabulary.
5. The teacher will observe and guide the students to assess their own learning.

STEM CONNECTIONS

Creating STEM Connections

Science - See standards listed above.

Technology

- Students have utilized scientific tools such as microscopes, stereoscopes, hand lenses, pipettes, petri dishes, collection materials, and document reader throughout their field experience at the River Center. Students can use tools found in the school's science laboratory/classroom to investigate items found throughout their schoolyard.
- River Center's Virtual Education Resources
  - **Fish Feeding Volume 1** – oyster reef and mangrove aquariums https://www.youtube.com/watch?v=u-0mwlnQa18&list=PLA39R2PcEo33NDR9rGFxW3StA--U_p99M&index=2
  - **Lox River Adventures Part 2** – estuary and oysters of the Loxahatchee River https://www.youtube.com/watch?v=WoKnu8F3Y-s

Engineering

- Research oyster reef restoration projects throughout the Loxahatchee River. Students can research where scientists and engineers found shell substrate, how they transported materials, and found the ideal location for the restoration project.
- Students can design their own "oyster reef condo" using art, craft, and recycled materials.

Mathematics - See standards listed above.

POST FIELD TRIP LESSON

Thank you for participating in a field trip at the River Center. We hope your students enjoyed their experience learning about the Loxahatchee River ecosystems as well as the different hands-on activities and animal encounters.

We are always looking for feedback and ways to improve our programs at the River Center. Please take a couple of minutes to complete the River Center's field trip survey. We would really appreciate it!

https://www.surveymonkey.com/r/RCSchoolSurvey

Please refer to the 5E lesson plan and the "Elaborate" section as a post-lesson activity. This is for you to utilize back in the classroom as a continuation of your experience at the River Center. They are an educational, fun, and creative way to gain more knowledge.

We appreciate your support and interest in the River Center and our programs. Please contact us with any questions or concerns. We look forward to seeing you and your students at the River Center in the future!

River Center - Loxahatchee River District
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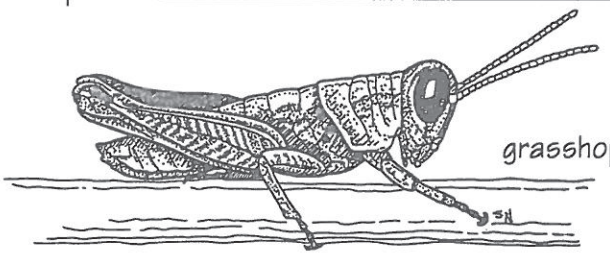
(561) 743-7123 ext. 4200
(561) 743-6314 [Fax]
education@LRECD.org
www.LRDRiverCenter.org
Explore | Experience | Connect

THERE'S NO PLACE LIKE HOME

Group Name_____ Group Members _____

_____

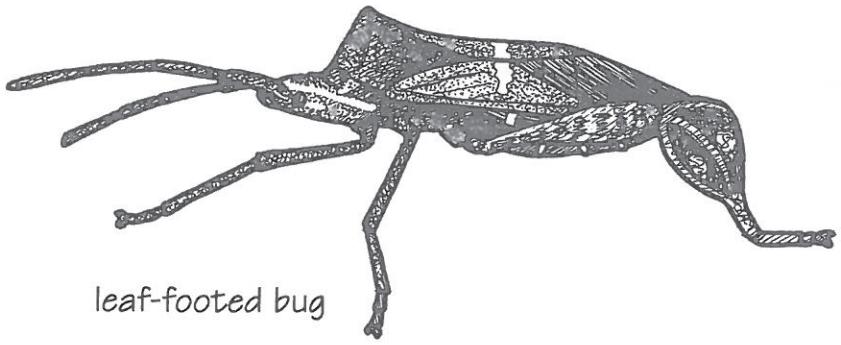
_____



grasshopper

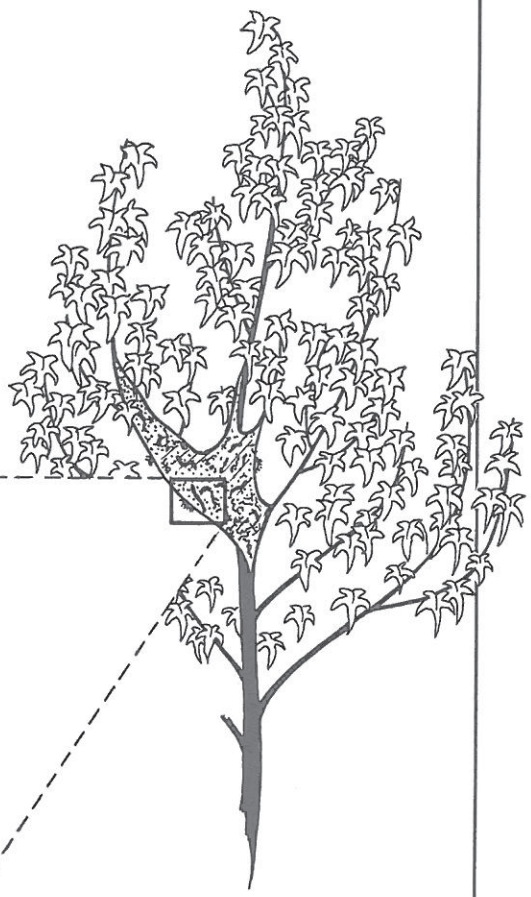
Imagine you are a grasshopper living on your plant. Describe the places on your plant that are like the ones described on this worksheet.

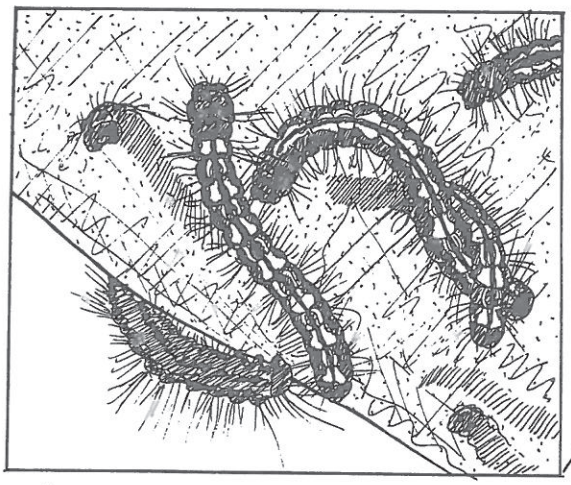
I LIVE IN A PLACE THAT:	LOCATION ON PLANT
is hot	
is sunny	
has lots of hiding places	
is cool most of the time	
is shady most of the time	
stays dry most of the time	
has places to land where I blend in	
has places to land where I do not blend in	
is very windy sometimes	
could allow rain to wash me away	
is wet or moist most of the time	



leaf-footed bug

Looking for different habitats





tent caterpillars

LOXAHATCHEE RIVER DISTRICT

FOCUS AREA CONNECTIONS

- Wastewater - Oysters as filter feeders
- Stormwater - Freshwater Discharges
- Water Supply - Brackish Water

RIVER CENTER EXHIBITS

Connecting the tour and the activity

◯ OYSTER REEF ESTUARY EXHIBIT

HANDS ON ITEMS: OYSTER SHELLS

Take a minute and just observe the exhibit

1. What are some things that you recognize in here?
2. The estuary is the area where the freshwater from the river mingles with the salt water from the ocean creating brackish water.
3. The composition of the water depends on different factors:
   a. rainfall (how much or how little),
   b. high tide or low tide
   c. how long conditions last
   d. animals living in this environment need to adapt to these changes quickly.
4. There are three critical habitats in the estuary:
   a. the mangroves,
   b. the seagrasses
   c. the oyster reefs.
5. This display is an example of an oyster reefs. Pretend for a minute that you are an oyster: you have no eyes, no mouth, no nose, no ears, no way to move.
   a. Why would you live here?
   b. Where does your food come from?
   c. How do you get your food?
6. Oysters are filter feeders, which means they pull the water over their gills and get their food from the water. How do you think this changes the water?
   a. Answer: water becomes cleaner

b. One oyster can clean between 30 to 50 gallons of water a day

7. If you look at the display carefully you will notice all the little nooks and crannies in between the oyster shells
   a. How do you think fish benefit from this?
   b. Answer: safe spaces to hide from predators
8. Animal ID:
   a. Hairy Blenny
   b. Snappers
   c. Grunts
   d. Puffers
   e. Goby
   f. Needle Fish
   g. Oysters (not real)
9. Where do you think the fish go when they are too big to be protected by the oyster beds but too small for the ocean?

LRD WASTEWATER EXHIBIT

1. Explain the biofilters and sand filtration at the wastewater treatment facility.
2. Compare how oysters filtering water in the river is similar to wastewater treatment.
3. Both result in cleaner, healthier water for the river, people in our community and wildlife.